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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/607,779	06/27/2003	Huaqing Yin	169.12-0590	6457
164	7590	09/21/2006	EXAMINER	
KINNEY & LANGE, P.A. THE KINNEY & LANGE BUILDING 312 SOUTH THIRD STREET MINNEAPOLIS, MN 55415-1002			TUGBANG, ANTHONY D	
			ART UNIT	PAPER NUMBER
			3729	

DATE MAILED: 09/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/607,779

Applicant(s)

YIN ET AL.

Examiner

A. Dexter Tugbang

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 22 June 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-12, 15 and 16 is/are pending in the application.
- 4a) Of the above claim(s) 3, 5, 6 and 9 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 15 and 16 is/are allowed.
- 6) ☒ Claim(s) 1, 4, 7, 8 and 10-12 is/are rejected.
- 7) ☒ Claim(s) 2 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- ☐ Notice of Informal Patent Application
- ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Response to Amendment***

1. The applicant(s) amendment filed on June 22, 2006 has been fully considered and made of record.

### ***Election/Restrictions***

2. Claims 3, 5, 6 and 9 continue to stand as being withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on December 21, 2005.

### ***Claim Objections***

3. Claim 2 is objected to because of the following informalities: "the photoresist" (line 3) should be changed to --a photoresist--.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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5. Claims 1, 4, 7, 8 and 10 through 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Applicant(s) Admitted Prior Art, referred to hereinafter as the AAPA, in view of Dimigen et al 3,904,462.

The AAPA (Prior Art Fig. 1 and the specification, page 3) discloses a method of making a reader for a magnetic head comprising: forming a sensor (e.g. 14) with an air bearing surface (ABS); forming a photoresist mask (e.g. 18) on the sensor extending from the air bearing surface a distance substantially equal to a desired stripe height of the sensor; and removing a portion of the sensor not covered by the photoresist mask to define the desired stripe height of the sensor (specification, page 3, lines 21-25).

Regarding Claim(s) 4, the AAPA further teaches forming a first half gap (e.g. 12) prior to the forming the sensor such that the sensor is formed above the first half gap.

Regarding Claim(s) 8, the AAPA further teaches that within the step of removing the portion of the sensor not covered by the mask, forming a steep back edge of the sensor (outline of tail 16 in Fig. 1).

The AAPA does not mention that the photoresist mask is a hard mask (as required by Claim 1) of insulating material (as required by Claim 10), or of a composition of aluminum oxide (as required by Claim 12).

Dimigen discloses that within photolithographic processes (e.g. ion beam etching), a photoresist mask (e.g. 2 in Figs. 2a to 2b) can be made of aluminum oxide (col. 3, lines 24+), which would thereby make the photoresist mask a "hard mask", for the advantages of a etching layer beneath the mask to very small thicknesses (see col. 2, lines 19+). The material of the

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photoresist mask of Dimigen is considered to be an “insulating material” because the mask (e.g. 2) insulates the layer beneath the mask (e.g. 3, 33) from the ions or etchant.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the photoresist mask of the AAPA by utilizing the photoresist mask material of Dimigen as a hard mask, for the advantage of etching to very small thicknesses.

Regarding Claim(s) 11, it would have been an obvious matter of design choice to choose any desired hard mask material since applicant(s) have not disclosed that the claimed hard mask material of “aluminum nitride” solves any stated problem or is for any particular purpose and it appears that the invention would perform equally well with the mask materials taught by either the AAPA or Dimigen et al. Moreover, the difference in materials of the hard mask between the applicant(s) claimed “aluminum nitride”, and the mask materials utilized by the AAPA or Dimigen et al, have no material impact on the method steps.

6. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over the AAPA in view of Dimigen et al, as applied to Claim 1 above, and further in view of Gill 6,396,669.

The AAPA, as modified by Dimigen et al, discloses the claimed manufacturing method as relied upon above. The modified AAPA method does not teach that the sensor is a GMR.

Gill shows that sensors can be more beneficial as GMRs by change of the resistance, or by providing a higher magnetoresistance (col. 2, lines 7-18).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the method of the AAPA by forming the sensor as a GMR, as taught by Gill, to provide the benefits of effecting a high magnetoresistance.

***Response to Arguments***

7. The applicant(s) arguments filed on June 22, 2006 with respect to the previous rejection regarding Lin et al, have been fully considered but have not been deemed to be found as persuasive. The applicant(s) note that Lin does not teach a “hard mask” because layer 312 is a capping layer and not a hard mask. The examiner most respectfully disagrees because layer 312 can be read as a hard mask because as shown in the sequence in Figures 19H to 19I, capping layer 312 acts together with mask layers 360, 362, 364 to shape the layers beneath it during etching, particularly that layer 312 is the top layer (as shown in Fig. 19I). Moreover, layer 312 defines a stripe height because it cannot possibly have a length that would extend from the ABS to its back end infinitely. Layer 312 must have a back end, or back edge, such that the stripe height is defined as the distance from the ABS to the back end, or back edge, of layer 312 or any of the other layers (e.g. 302, 304, 306, 308). So the examiner’s position is that Lin met the original limitations of “forming a hard mask on the sensor extending from the air bearing surface a distance substantially equal to a desired stripe height of the sensor” (as recited in Claim 1 originally).

The new grounds of rejection set forth above is based on the new limitations added to Claim 1 that require “removing a portion of the sensor not covered by the hard mask *to define the desired stripe height of the sensor*” (last 2 lines of Claim 1, emphasis added). Lin does not teach that when a portion, or portions, of the sensor are removed, no stripe height is defined as a result of the removal.

*Allowable Subject Matter*

8. Claims 15 and 16 are allowed.
9. Claim 2 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
10. The following is a statement of reasons for the indication of allowable subject matter.

Regarding Claim(s) 2, the prior art does not teach all of the limitations of the claimed invention including removing a portion of the sensor not covered by the hard mask to define the desired stripe height of the sensor, where forming the hard mask further comprises depositing a hard mask layer over an entire top surface of the sensor, patterning a photoresist mask on a first portion of the hard mask layer, and removing a second portion of the hard mask layer not covered by the photoresist.

Similar limitations with respect to Claim 2 are also required in Claim 15 (at lines 5-10).

*Conclusion*

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

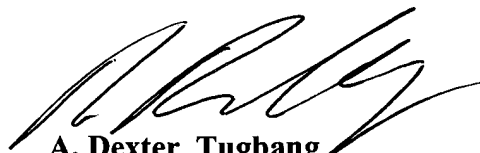
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will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to A. Dexter Tugbang whose telephone number is 571-272-4570. The examiner can normally be reached on Monday - Friday 7:30 am - 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Peter Vo can be reached on 571-272-4690. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



**A. Dexter Tugbang**  
**Primary Examiner**  
**Art Unit 3729**

September 14, 2006